

September 25, 2000 Office Action as being unelected in response to earlier restriction and election of species requirements.

In the Office Action dated September 25, 2000, claims 1, 2, 6, 18, 20, 22, 24, 29, and 30 were rejected under 35 U.S.C. §103(a) for obviousness in view of the D'Agostino U.S. Patent No. 4,012,303. Claim 30 was rejected under 35 U.S.C. §112, second paragraph, as being indefinite.

**Response to Rejection under 35 U.S.C. §103**

In the September 25, 2000 Office Action, claims 1, 2, 6, 18, 20, 22, 24, 29 and 30 were rejected under 35 U.S.C. §103(a) as being obvious over D'Agostino. According to the Office Action, D'Agostino teaches membranes of the present polymer base grafted with monomer units of present formula (I). The Office Action acknowledged, however, that D'Agostino does not disclose non-hydrogen substituents "A<sub>1</sub>" and "A<sub>2</sub>", and that applicants' elected species differs from D'Agostino by a methylene group. The Office Action concluded that the difference among the applicants' claimed graft polymeric membranes having substituent "A<sub>1</sub>" and "A<sub>2</sub>" groups, on the one hand, and D'Agostino's unsubstituted compounds, on the other hand, was analogous to a homologous relationship and, therefore, it would have been obvious to expect homologs to possess similar physical and chemical properties in

keeping with their closely related structures. (See Office Action at page 3).

Applicants submit that a *prima facie* case of obviousness has not been established, and indeed cannot be established, as there is no motivation provided to modify D'Agostino's monomers to produce the applicants' claimed graft polymeric membranes. To the contrary, prior art teaches away from the very modification upon which the Office Action relies, as discussed in more detail below.

Applicants' claimed graft polymeric membranes comprise a preformed polymeric base to which has been graft polymerized a substituted  $\alpha,\beta,\beta$ -trifluorostyrene ("TFS") monomer and/or a substituted trifluorovinyl naphthalene monomer. As set forth in the specification, the use of substituted TFS in graft polymerization has distinct advantages over conventional, prior art TFS membranes and graft membranes. For example, activating substituents on the TFS monomer may lead to increased reactivity in the grafting reaction of the monomers. (See applicants' specification at page 3).

By contrast, D'Agostino only discloses the preparation of graft polymeric membranes by radiation grafting of unsubstituted

TFS monomer to a polymeric base film. D'Agostino does not disclose or suggest that substituted TFS could or should be graft polymerized onto a polymeric base film.

Moreover, there is no motivation or suggestion in the prior art to modify D'Agostino's unsubstituted TFS monomer to arrive at the substituted TFS monomers and use them in a graft polymerization reaction. The Office Action relies on an analogy to a homologous relationship in support of the obviousness rejection. While particular types or categories of structural similarity have been relied upon to make a *prima facie* obviousness rejection, the Federal Circuit has also discouraged the use of such generalizations. See *In re Jones*, 958 F.2d 347, 349-50 (Fed. Cir. 1992) ("And in any event, this court has previously stated that generalization is to be avoided insofar as specific structures are alleged to be *prima facie* obvious one from the other."). In the present case, structural similarity alone is insufficient to establish *prima facie* obviousness, in view of the teachings of the prior art.

Although none of the prior art references of record discuss the reactivity of substituted TFS in graft polymerization reactions, the reactivity of substituted styrenes in graft polymerization reactions is discussed, for example, in S. Dilli

and J. L. Garnett, "Radiation-Induced Reactions With Cellulose", Aust. J. Chem., 1970, 23, 1163-73, a copy of which is attached hereto at Tab A. As stated on page 1170-1171 of that reference:

It can be argued that the reaction of a free radical should be indifferent to the electronic nature of an associated substituent. However, Price has discussed the influence of substituents upon the polarization and electron density of the vinyl double bond in order to account for certain anomalies in copolymerization reactions. Price concluded that reaction was favoured by the more stable transition state such as existed between a positively polarized radical and a negatively polarized double bond. From these concepts, the reactivity of the styrenes in free-radical polymerization reactions has been stated by Chen and Stamm to be as follows: styrene with electron-donating groups < styrene < styrene with electron-withdrawing groups. It may be noted that head-to-tail addition of substituted monomers to the growing radicals will be favoured because of the greater resonance stabilization possible in the radicals so formed.

The results (Table 5) for the substituted styrenes generally fit the proposed classification of the monomers. Thus, low grafting yields were obtained for those monomers containing electron-donating substituents whereas extensive grafting occurred with the monomers in which electron-withdrawing groups were substituted in the benzene ring. (Emphasis added).

The prior art thus teaches that styrene monomers having electron-donating substituents had lower reactivities in graft polymerization reactions, relative to unsubstituted styrene. This is directly relevant to applicants' claimed subject matter in that the substituents "A<sub>1</sub>" and "A<sub>2</sub>" tend to be electron-donating substituents. For example, the methyl substituent in the elected species is an electron-donating group.

In this case, any inference of similar properties based upon similarity of structure is inappropriate, and some other suggestion to modify the D'Agostino is required. "The mere chemical possibility that one of those prior art acids could be modified such that its use would lead to the particular cephem recited in claim 6 does not make the process recited in claim 6 obvious 'unless the prior art suggested the desirability of [such a] modification.'" *In re Ochiai*, 71 F.3d 1565, 1570, 37 U.S.P.Q.2d 1127 (Fed. Cir. 1995), citing *In re Gordon*, 733 F.2d 900, 902, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984).

Applicants submit that persons of ordinary skill in the technology involved here, considering the reactivity of substituted styrene monomers, would expect, based upon teachings like Dilli and Garnett above, that TFS monomers having electron-donating substituents would have lower reactivities relative to

unsubstituted TFS and would be motivated not to employ such substituents. Indeed, in relation to the present elected species, applicant notes that the p-methylstyrene monomer in Table 5 of Dilli and Garnett exhibited a 5-fold reduction in reactivity as compared to styrene (see Dilli and Garnett at page 1169).

Contrary to the teachings of Dilli and Garnett, applicants' claimed graft membranes, with the elected species p-methyl-TFS, grafted to poly(ethylene-co-tetrafluoroethylene) base films, achieve a high percent graft rate in a relatively short time. In Example 1, the percentage graft was 79%, achieved after 24 hours (see applicants' specification at page 27, lines 5-9). In Example 2, the percentage graft was 67%, achieved after only 3 hours (see applicants' specification at page 27, line 28 - page 28, line 2). Similarly, applicants' Examples 3 and 4 achieved percentage grafts of 49% and 35%, respectively, after 60 hours.

D'Agostino teaches graft polymerization of unsubstituted trifluorostyrene ("TFS") onto a base film, in which the base film and a TFS solution were placed in a sealed chamber and irradiated for about two weeks at a suitable dose rate (see D'Agostino at column 5, lines 4-19). As shown in D'Agostino's Table III (column 6), the percentage graft of TFS to tetrafluoroethylene-

hexafluoropropylene (FEP) films was 3.3% after 51.5 hours, and 29.9% after 402 hours. D'Agostino also lists graft membranes with percent grafting of TFS of 32.0% (column 9, Table VII), 32.9% (column 9, Table VIII), and 46.2% (column 11, Table 11).

Thus, contrary to teachings of Dilli and Garnett, applicants' claimed graft polymeric membranes, having a para-methyl- $\alpha,\beta,\beta$ -trifluorostyrene substituent group, are readily graft polymerizable with favorable reactivity.

Applicants therefore submit that D'Agostino does not, and cannot render obvious the applicants' claimed graft polymeric membranes.

#### **Response to Rejection under 35 U.S.C. §112**

Claim 30 was also rejected in the September 25, 2000 Office Action under 35 U.S.C. §112 for indefiniteness. Taken in context, the expression "...at least a portion..." in claim 30 is definite and particular. The full claim text reads, "A membrane according to any one of claims 1, 20-23, 28 or 29 wherein at least a portion of the grafted chains are crosslinked." In this context, the claim language clearly conveys that some (and possibly, though not necessarily, all) of the grafted chains are cross-linked. Applicants should not be required to define "at

least a portion" in terms of a numerical limitation or cut-off. See *In re Marosi*, 710 F.2d 799, 802 (Fed. Cir. 1983) ("Insofar as it requires appellants to specify a particular *number* as the cutoff between their invention and the prior art, the PTO's position is impractical. Appellants' invention does not reside in such a number.").

#### Supplemental Information Disclosure Statement

Applicants' Supplemental Information Disclosure Statement, submitted concurrently herewith, provides copies of each of the two references cited in the International Search Report for the PCT/International application, No. PCT/CA00/00337, corresponding to the present U.S. application. Those two references are U.S. Patent Nos. 4,113,922 and 4,169,023. A copy of the International Search Report is also being provided.

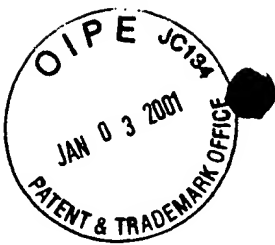
D'Agostino et al. U.S. Patent No. 4,113,922 claims priority from the D'Agostino '303 patent already of record in the present application and discussed above. The D'Agostino '922 patent discloses radiation grafting of TFS to polymeric base films using gamma ray co-irradiation, followed by the introduction of various ion-exchange substituents. The '922 patent does not, however, disclose or suggest TFS, or any other monomer, having the applicants' recited non-hydrogen substituents A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub> or B<sub>2</sub>.



Sata et al. U.S. Patent No. 4,169,023 discloses electrolytic diaphragms having a main layer and a secondary layer. Sata's main layer is composed of a polymer membrane containing a cation exchange group and a fluorine atom chemically bonded thereto, and the secondary layer has an electrically neutral layer and/or an anion exchange layer. The '023 does not, however, disclose or suggest monomers having the applicants' recited non-hydrogen substituents A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub> or B<sub>2</sub>, and does not disclose or suggest any graft polymerization techniques.

\* \* \* \* \*

In view of the foregoing remarks and submissions, applicants submit that claims 1, 2, 6, 18, 20, 22, 24, 29, and 30 are allowable. Applicants also submit that unelected claims 3-5, 7-17, 19, 21, 23, 25-28 and 31-63, withdrawn from consideration in the September 25, 2000 Office Action, should be considered and allowed in view of the allowability of the elected claims. The Examiner is invited to telephone the applicants' undersigned attorney at (312) 775-8202 if any unresolved matters remain.



Please charge any fees incurred in connection with this submission to Deposit Account No. 13-0017.

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